19 BUNDESREPUBLIK
DEUTSCHLAND

DEUTSCHES
PATENTAMT

(12) Utility model

(10) DE 29613795 U1

21 File number: 296 13795.2
22 Date of filing: 12. 7.96
67 from Patent application: P 196 28 201.2
47 Registration date: 5.12. 96
43 Notification in Patent sheet: 23. 1.97

73 Patent holder:
Inometa GmbH, 32052 Herford, DE

74 Representative:
TER MEER-MÜLLER-STEINMEISTER & Partner,
Patentanwälte, 33617 Bielefeld

54 Roller with optimized bending behavior

ROLLER WITH OPTIMIZED BENDING BEHAVIOUR

The inventions is related to a roller with optimized bending behaviour.

Rollers are implemented in different areas of the production industry. This is not only applicable for actual rolling process in steel production, but also in the several areas of production such as printing equipment, Transport rollers in Textitle and paper industry etc.

With the development of larger and broader machines, weight of the relevant long roller adversely tumbles to the extend of unavoidable deflection in intermediate segment. Presently, a very high stiffness can be obtained by using mixed materials of glass fibers or carbon fibers and other composite materials, apart from steel and aluminium, which is less in weight, in the production. Also here the roller length ranges from 6 to 8 m in size and subsequently it leads to insignificant deflection in the intermediate section. Further increase in the material quality is done mosly based on the cost, which is actually not taken into consideration. The expansion of the roller diameter would be carried out in commonly unavailable floor space and incidently the cost and energy requirement for the roller also increases inappropriately in the production.

Consequently there is a solution, that the step bearing will not exist at the end of the tubular roller, but it will be moved to middle of the roller from both the side. This leads to the avoidance of roller-end more or less, however the intermediate area can be kept substantially straight between both of the support. If substantial deflection is allowed in the roller-end, then there will be a buldge in the intermediate section accordingly, which is counteracted by relevant deflection. The bending contour of roller can vary as per the bearing space inside the roller and subsequently it will be optimized as per own requirement. Here "Optimized" means a slight variation can be seen critically at the roller end far lesser than a deflection in the middle.

The placement of both step bearing often seems to be technically difficult with respect to long tube roller, so that the usage possibilities for roller length is almost limited in practice.

The inventions basically involves with the task of managing this kind of roller type, which suppress the deflection of the roller in the middle of the roller and subsequently optimize the bending behaviour of the roller altogether.

These activities can be worked out in the above displayed roller, so that the roller is combined with external tube roller and supporting shaft which is kept in the tube roller, where there is a space in the inner area of the tube roller and long diameter in longitudinal central area, which is found towards the inner surface of tube roller.

By designing the inner tube with the increase in diameter over the middle section, a support can be created in the external tube roller through two inwardly roll bearing, without this there could be a complicated bearing support problem possibly.

Actually, the support shaft is a tube, that gives a high stiffness in proportion to material expenditure.

The usage of the application is not limited to specific rolling element. It is also considered for Steel, Aluminium, glass-fibre reinforced plastic, carbon-fibre reinforced plastic or other composite material and also for any other roller-specific materials.

Particularly, the supporting shaft is connected, welded and sticked fixedly with the inner surface of the tube roller longitudinally.

During the manufacturing of composite materials, especially CFK and GFK, where a roller is manufactured by winding individual layers, there exist a possibility of producting a supporting shaft and tube roller in combination, where the cylindrical core is provided through winding both the ends of supporting shaft, which are pulled out after the completion.

The bearing of the roller takes place over the inner supporting shaft, which have bearing pin at the end in the real time. If the inner supporting shaft is tube-form, then the used end pieces are included on both the ends, where the bearing pins can be found.

In the following, few examples of inventions are explained along with illustrations below.

Fig. 1 is a schematic longitudinal section where a first design form of a invention based wiring;

Fig. 2 is a corresponding representation of further implmentation form of invention;

Fig. 3 display a longitudinal section by a third implementation form of invention;

Fig. 4 illustrates a possible manufacturing process for a invension based wiring.

The displayed longitudinal section should not be viewed as full-scale features with respect to its diameter length. Especially the diameter length can be essentially bigger than as displayed in the illustration.

In fig. 1, a roller which is illustrated in tube roller is referred with 10 over the external side, whereas in the inner part of the tube roller, a supporting shaft 12 is found, where the protruding ends are connected with bearing bin 14 and 16 in both the side of the tube 10.

In the inner part of the tube roller 10, there exist one of the supporting shaft in relation to the length of tube roller 10, middle section 18 with bigger diameter and 2 end sections 20 and 22 with smaller diameters. In between the end section 20 and 22 and in the inner surface of the tube roller 10, there exist a cylindrical intermediate space 24 und 26. In contrast, the middle section 18 of the supporting shaft is measured so that it touches and subsequently supports the inner surface of the tube roller. The pheriperal surface in the middle section 18 between both of the points 28 and 30 in Fig. 1, has similar effects in the same way as mentioned in the step bearing points 28 and 20, which has been used in the techical point of view.

On otherside, a complicated bearing of tube roller is not required in point 28 and 30.

By the solution which is displayed in Fig. 1, the end section of the tube roller 10 protrude on both sides of the supporting shaft mid-section 18. Since there is a distance between supporting shaft end-section 20 and 22, certain deflection is allowed here. This deflection which in turn, leads to relevant bulge in the mid-section of tube roller, which counteracts the tube-roller deflection in the mid-section along with the shaft-supporting effect of mid-section 18.

Using the implementaiton form as mentioned in Fig. 1, the mid-section 18 and 25 take both the end-section 20 and 22 with one third of the length in supporting shaft 12. However the mid-section 18 can vary as per 20 and 22 end section features, when it is requested for individual use-cases and essential bending behaviour.

The implementation form, which is mentioned in Fig. 2 differs from Fig 1. Fig.2 displays a supporting shaft 32, which in turn used as tube. In both the ends of tube-form supporting shaft 32, the end-piece 34, 36 is found, where bearing pin 14,16 can be provided. In the rest, there exist a co-relation with first implementation form as per Fig.1, so that the same reference number is used and can be taken from the previous description.

Fig. 3 displays the execution form, which is co-releated with fig.2 and also it should not be explained still one more time on a whole. Fig. 3 displays mehrly an addition to the surface of supporting shaft (32) mid-space (18) and resp. relevant inner surface of tube roller (10), a adhesion (38), which bonds the suporting shaft and tube roller fixedly. According to the type of used materials, another combination of supporting shaft and tube roller (Welding or press fit) can also be used. A fixed combination of two parts is not essential for desired results in the invention, as long as an axial and radial definition is ensured between supporting shaft and tube roller.

Fig. 4 illustrates a possible production method for an invented roller by using composite material, such as CFK or GFK, and production of roller by wrapping plastic based fibre material, which includes glass fiber or carbon fibers. In this case, the inner supporting shaft can be wrapped at first completely in the small diameters till both the end-section 20,22 will become thick. Subsequently the cylindrical core 40,42 is deferred at the end-section, and the wrapping process in the mid-section (18) of supporting shaft (32) is continued, till the core (40,42) reaches high. Finally again the corresponding diameter is created by other wrapping throughout the complete length of tube roller (10).

By using relevant core 40,42, the casting methods can be processed, as long as the available materials if necessary, should be considered.

The production methods are not essential for the given invention. It is essential to manage a load-bearing and supporting connection by extending the diameter of supporting shaft in the mid-section of tube roller, while the end-section of tube roller remains distant to the supporting shaft.

CLAIMS

1. Roller with optimized bending behaviour, **characterized,** that the roller is combined externaly with roller tube (10) and internally arranged with supporting shaft (12), where it has a space in the inner surface of the roller tube (10) and a section (10) with bigger diameter remains in the inner surface of the roller tube.

2. Roller according to claim 1, **characterized,** that the supporting shaft (32) is used as tube.

3. Roller according to any one of the claims 1 or 2, **characterized,** that the roller is composed of steel, aluminium, GFK, CFK or any other composite materials either partially or completely.

4. Roller according to any one of the claims 1 to 3, **characterized,** that the supporting shaft (32) is connected fixedly in the longitudinal secton (18) over the inner surface of the tube rollers, especially it is welded and sticked together fixedly.

5. Roller according to any one of the claims 1 to 3, **characterized,** that the supporting shaft (12,32) in longitudinal area is used in (18) section with one piece of the Tube roller.

6. Roller according to any one of the preceding claims, **characterized,** that the middle section (18) and both end section (20,22) the supporting shaft (12,32) takes approximately one third of the length.

26.10.96

Fig. 1

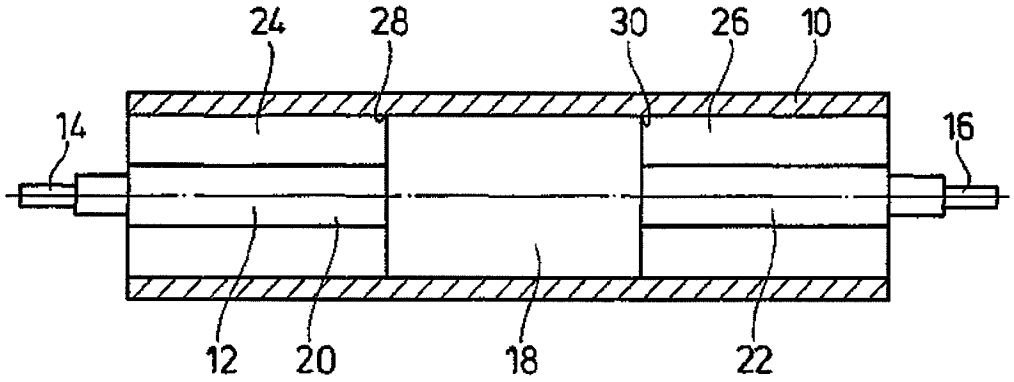


Fig. 2

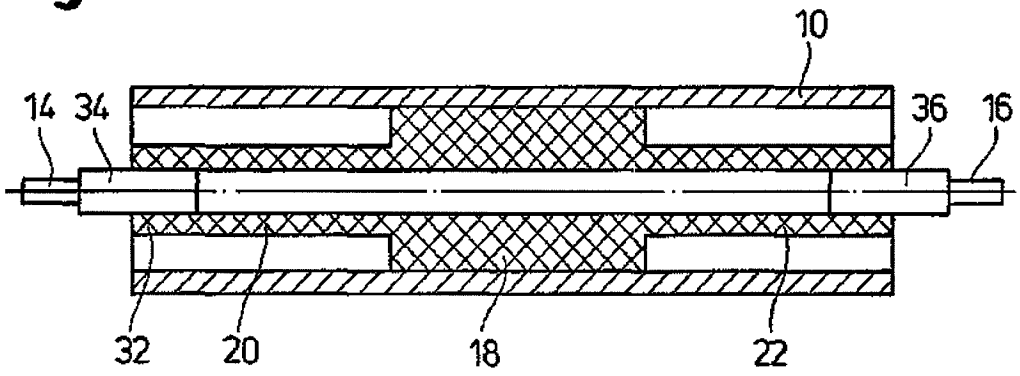


Fig. 3

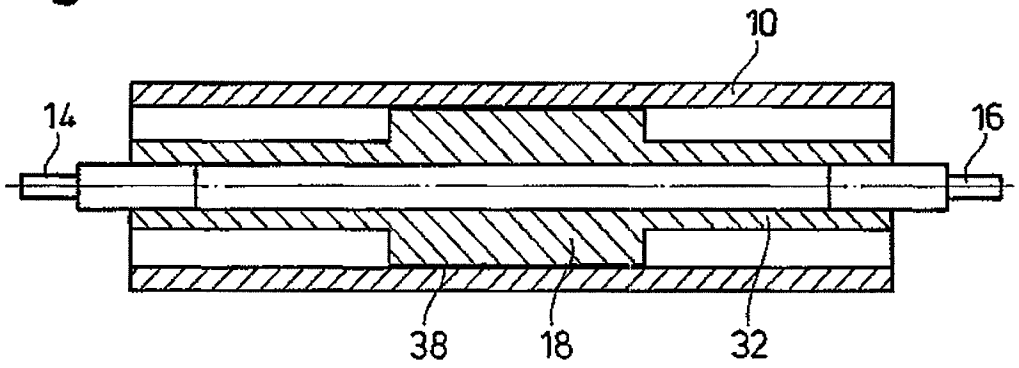
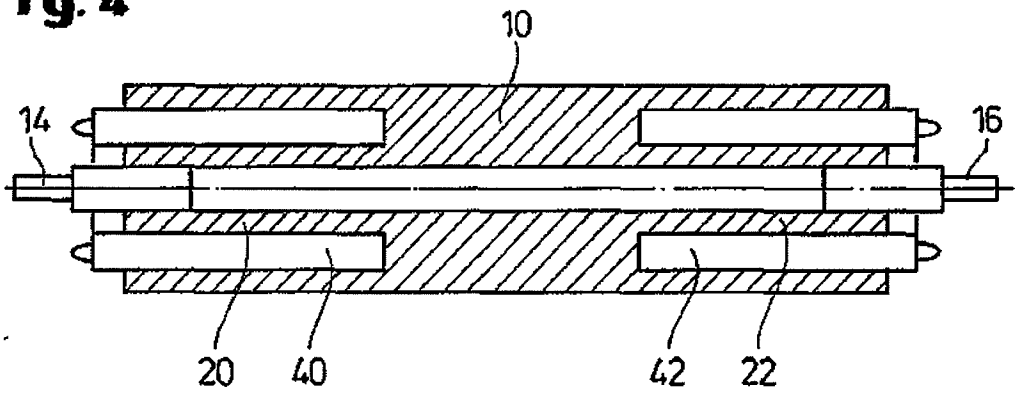


Fig. 4

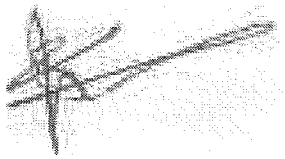


TRANSLATOR'S CERTIFICATION

I, S. Prakash, hereby certifies on this 16th day of August, 2010 that the attached Document:

- DE29613795

is, to the best of my knowledge and belief, true and accurate English translation of the original Deutsch documentation.



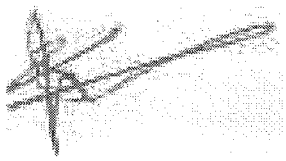
Name: Prakash S.

TRANSLATOR'S CERTIFICATION

I, S. Prakash, hereby certifies on this 16th day of August, 2010 that the attached Document:

- DE29613795

is, to the best of my knowledge and belief, true and accurate English translation of the original Deutsch documentation.



Name: Prakash S.